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NASA TECH BRIEF

Lewis Research Center



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Ultrasonic Metal Etching for Metallographic Analysis

Experiments have indicated that selective metal etching for metallographic analysis may be achieved by an ultrasonic etching method. The ultrasonic etch delineates microstructural features which may



not be discernible in specimens prepared for metallographic analysis by standard chemical etching procedures.

A magnetostrictive transducer was used to generate ultrasonic vibrations which were transmitted to a

layer of distilled water separating the transducer head from the metal specimen. Cavitation bubbles in the ultrasonically excited water produced preferential damage (etching) of the metallurgical phases or grain boundaries, depending on the hardness and toughness of the phase or structure of the metal specimens. The materials studied were the unalloyed metals, zinc, nickel 270, iron, and tantalum, and the nickel-base alloy Udimet 700.

An electron microscope replica of the surface of the latter, which was subjected to cavitation in water at room temperature for two hours, is shown in the illustration.

Notes:

1. Etched particles may readily be recovered from the water (or other liquid) for further analysis.
2. The following documentation may be obtained from:

National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.95)

Reference:

NASA-TN-D-6014 (N70-38568), Study of Cavitation Damage to High-Purity Metals and a Nickel-Base Superalloy in Water

3. Technical questions may be directed to:
Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B71-10099

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: S. G. Young
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